

Serial No. 10/628,492  
Docket No. T36-157944M/RS

6

**REMARKS**

Claims 1-9 and 12-27 are all of the claims presently pending in the application. Claims 1, 5 and 16-20 have been merely editorially amended in accordance with local practice and have not been substantively amended. Claims 21-27 have been added to provide more varied protection for the claimed invention and to claim additional features of the invention.

Applicant concurrently files herewith an Excess Claim Fee Payment Letter, and corresponding excess claim fee, for five (5) excess total claims.

As a preliminary matter, Applicant appreciates courtesies extended to Applicant's representative in the productive personal interview conducted on December 21, 2005. Applicant's Statement of the Substance of the Interview is included herewith.

It is noted that the claim amendments are made only for more particularly pointing out the invention, and not for distinguishing the invention over the prior art, narrowing the claims or for any statutory requirements of patentability. Further, Applicant specifically states that no amendment to any claim herein should be construed as a disclaimer of any interest in or right to an equivalent of any element or feature of the amended claim.

Claims 1-6, 12 and 14-20 stand rejected under 35 U.S.C. §112, second paragraph, as being indefinite. Claims 1-2, 6, 14, 18 and 19 stand rejected under 35 U.S.C. § 102(b) as being anticipated by IBM Technical Disclosure Bulletin (TDB-ACC-NO: NN75101486, Vol. 18, Issue 5) (hereinafter "IBM"). Claims 5 and 15-17 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over IBM. Claims 4 and 15 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over IBM in view of Fujitsu LTD (JP 53016396A) (hereinafter "Fujitsu"). Claims 3 and 12 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over IBM in view of Kawama et al. (U.S. Patent No. 5,665,607) (hereinafter "Kawama"). Claims 7-9, 13 and 20 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over IBM in view of Kamimura (JP 2000-036619).

These rejections are respectfully traversed in the following discussion.

**I. STATEMENT OF SUBSTANCE OF INTERVIEW**

As a preliminary matter, Applicant's representative would like to thank the Examiner for courtesies extended in the personal interview conducted on December 21, 2005.

Serial No. 10/628,492  
Docket No. T36-157944M/RS

7

An Examiner's Interview Summary Record (PTOL-413) was provided by the Examiner at the interview on December 21, 2005.

Applicant submits this Statement to comply with the requirements of M.P.E.P. § 713.04.

In the interview, the following was discussed:

**A. Identification of claims discussed:**

Claim 1.

**B. Identification of prior art discussed:**

IBM Publication NN75101486.

**C. Identification of principal proposed amendments:**

Claim 1. (Currently Amended) A method of producing a crystal growth substrate, comprising:

molding a seed substrate into a desired shape so that irregularities are provided to a sapphire growth surface of said seed substrate;

growing a sapphire crystal on said sapphire growth surface of said seed substrate to thereby form a sapphire substrate; and

removing said seed substrate selectively from said sapphire substrate formed by said growing a sapphire crystal,

wherein said irregularities comprise cavities ~~are~~ formed periodically in said sapphire growth surface of said seed substrate during said molding ~~a~~ said seed substrate.

**D. Brief Identification of principal arguments:**

Applicant's representative respectfully pointed out that the claimed invention (e.g., as

Serial No. 10/628,492  
Docket No. T36-157944M/RS

8

defined in claims 1 and 20) is directed to a method of producing a crystal growth substrate wherein the irregularities include cavities formed periodically in the sapphire growth surface of the seed substrate during the molding a seed substrate (e.g., see Application at page 3, line 17, through page 4, line 2 and Figure 1B). These features are important for improving the external quantum efficiency of a semiconductor light-emitting element, as well as light-condensing characteristics and light directivity (see Application at page 3, lines 9-15).

**E. Results of the Interview:**

In response to the arguments presented, the Examiner indicated that the limitation argued above did not appear to be taught or suggested by the IBM reference. The Examiner indicated that she would consider Applicant's arguments when reviewing Applicant's next Amendment.

**F. Conclusion:**

Applicant respectfully submits that the IBM does not teach or suggest each and every element of the claimed invention.

**II. THE CLAIMED INVENTION**

The claimed invention (e.g., as defined in claim 1) is directed to a method of producing a crystal growth substrate wherein the irregularities include cavities formed periodically in the sapphire growth surface of the seed substrate during the molding a seed substrate (e.g., see Application at page 3, line 17, through page 4, line 2 and Figure 1B).

The claimed invention (e.g., as defined in claim 7) is directed to a method of producing a semiconductor light-emitting element. The method includes growing a desired semiconductor layer as a crystal on a sapphire substrate grown on a seed substrate and removing the seed substrate (e.g., see Application at page 6, line 19 through page 7, line 6).

Serial No. 10/628,492  
Docket No. T36-157944M/RS

9

These features are important for improving the external quantum efficiency of a semiconductor light-emitting element, as well as light-condensing characteristics and light directivity (see Application at page 3, lines 9-15).

### III. 35 U.S.C. §112, SECOND PARAGRAPH, REJECTION

The Examiner has rejected claims 1-6, 12 and 14-20 under 35 U.S.C. §112, second paragraph, as being indefinite. Specifically, the Examiner alleges that it is not clear how the term "irregularities" is different for the term "cavities". Additionally, regarding claim 20, the Examiner alleges that the limitation "wherein cavities are formed periodically in a sapphire growth substrate of said seed substrate" is unclear.

Applicant has amended claims 1 and 20 to more particularly define the claimed invention. Specifically, claim 1 has been amended to recite "wherein said irregularities comprise cavities formed periodically in said sapphire growth surface of said seed substrate during said molding a seed substrate" (emphasis added). Additionally, claim 20 has been amended to recite "wherein cavities are formed periodically in a sapphire growth surface of said seed substrate".

In view of the proposed amendments, Applicant respectfully requests the Examiner to reconsider and withdraw this rejection.

### IV. THE CLAIM REJECTIONS BASED ON PRIOR ART GROUNDS

#### A. The IBM Reference

The Examiner alleges that IBM teaches the claimed invention of claims 1-2, 6, 14, 18 and 19. Furthermore, the Examiner alleges that the claimed invention of claims 5 and 15-17 would have been obvious in view of IBM. Applicant submits, however, that IBM does not teach or suggest each and every feature of the claimed invention.

That is, IBM does not teach or suggest "*wherein said irregularities comprise cavities formed periodically in said sapphire growth surface of said seed substrate during said molding a seed substrate*", as recited in claim 1, and similarly recited in claim 20.

The Examiner alleges that IBM teaches growing sapphire on silicon, wherein the silicon layer has cavities. The Examiner attempts to rely on Figures 2A-2B and the Abstract of IBM to support her allegations. However, Applicant submits that the Examiner is clearly incorrect.

Serial No. 10/628,492  
Docket No. T36-157944M/RS

10

That is, nowhere, in these figures nor this passage (nor anywhere else for that matter) does IBM teach or suggest a method of producing a crystal growth substrate wherein the irregularities include cavities formed periodically in the sapphire growth surface of the seed substrate during the molding a seed substrate. Indeed, IBM merely teaches using a silicon wafer having an etching pit as a negative die for the production of a sapphire styli.

The claimed invention provides a method of producing a crystal growth substrate wherein the cavities are formed periodically in the sapphire growth surface of the seed substrate during the molding a seed substrate. The plurality of irregularities (e.g., cavities) formed on the seed substrate allows for molding to be easily performed so that a large number of microlens-shaped convex portions are arranged in a rear surface of the sapphire substrate.

IBM merely discloses that SiO<sub>2</sub> is grown on both sides of a bilaterally polished, n-type, crystal oriented silicon wafer. The SiO<sub>2</sub> is subsequently removed on the bottom side by buffered hydrofluoric acid. The wafer is etched to form an etching pit (see IBM at Abstract). The etching pit is indicated by the lines (111) in Figure 2B. Figures 1 and 2B clearly show that there are no cavities in the surface of the Si layer, the etching pit (i.e., the sapphire growth surface) or the final sapphire styli (see Figure 1). Therefore, IBM clearly does not teach or suggest molding a seed substrate into a desired shape so that irregularities are provided to a sapphire growth surface of the seed substrate.

The Examiner alleges that the silicon layer of IBM has cavities, which are allegedly depicted in Figures 2A and 2B. Again, Applicant submits that IBM does not teach or suggest that the irregularities are formed in the seed substrate. Assuming, *arguendo*, that the trench portion of IBM is a "cavity", the trench portion would merely teach a single cavity, and would not teach or suggest "cavities" as recited in exemplary claim 1.

However, it is still unclear as to which feature of IBM the Examiner is relying as teaching "irregularities" and "cavities". Indeed, the Examiner merely directs the Applicant to Figures 2A and 2B of IBM, but does not indicate which features in those figures she is relying on.

Applicant points out that the Examiner's rejection fails to comply with 37 C.F.R. §1.104(c)(2) which requires that "the particular part relied on must be designated as nearly as practicable. The pertinence of each, reference, if not apparent, must be clearly explained and each rejected claim specified". In this case, the Examiner has failed to point out which features of the IBM reference that may have been relied upon. Applicant submits that it is

Serial No. 10/628,492  
Docket No. T36-157944M/RS

11

unclear where IBM teaches or suggests "cavities" or "irregularities" in the substrate of the IBM device.

Therefore, if the Examiner wishes to persist with this rejection Applicant requests that the Examiner specifically point out where the claimed features are taught in the reference (i.e., rather than merely referring to a Figure in the reference).

In a teleconference conducted on September 23, 2005, the Examiner alleged that IBM teaches using several trenches to form several sapphire styli (although the Examiner has not provided any support for this allegation in IBM). Even assuming, *arguendo*, that the Examiner is correct, IBM would not meet the plain meaning of the claimed invention.

That is, the Examiner is alleging that IBM teaches a plurality of seed substrates, each having a trench, for forming a plurality of sapphire styli. In stark contrast, the claimed invention recites cavities formed periodically in the sapphire growth surface of the seed substrate. The plurality of cavities are formed in a single seed substrate to form a plurality of protrusions on a surface of the resulting sapphire substrate. This feature is clearly not taught or suggested by the cited prior art reference.

Therefore, Applicant submits that there are elements of the claimed invention that are neither taught nor suggested by IBM. Therefore, the Examiner is respectfully requested to reconsider and withdraw this rejection.

#### **B. The Fujitsu Reference**

The Examiner alleges that Fujitsu would have been combined with IBM to teach the claimed invention of claims 4 and 15. Applicant submits, however, that these references would not have been combined as alleged by the Examiner and that, even if combined, the combination of references would not teach or suggest each and every element of the claimed invention.

That is, Applicant submits that there is no motivation to combine the references as alleged by the Examiner. Indeed, the Examiner has not even provided a motivation for combining the references.

Applicant points out to the Examiner that MPEP § 2142 states "[t]o establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine the reference

Serial No. 10/628,492  
Docket No. T36-157944M/RS

12

teachings" (emphasis in MPEP) and that "it is the duty of the examiner to explain why the combination of the teachings is proper". The Examiner has not provided her reasoning for combining the references. Therefore, Applicant submits that the Examiner has clearly not made a *prima facie* case of obviousness.

The Examiner still does not provide any reasoning or motivation for combining Fujitsu with IBM. That is, the Examiner merely states that Fujitsu teaches "heat treating the grown sapphire at a temperature 1270°C to form alpha sapphire (alumina) layer" (see Office Action dated September 28, 2005 at page 5)". Again, the Examiner has not provided any motivation to modify IBM. The Examiner has merely stated what features Fujitsu allegedly teaches but does not provide any reasoning for why there is motivation to combine those features with IBM.

Furthermore, there does not appear to be a need in IBM to heat treat the sapphire to form alpha phase sapphire. Thus, as pointed out in MPEP 2143.01, the Examiner's motivation is "improper". "The mere fact that references can be combined or modified does not render the resultant combination obvious **unless the prior art also suggests the desirability of the combination**" (emphasis added by Applicant). Therefore, Applicant submits that the Examiner has clearly not made a *prima facie* case of obviousness.

Moreover, neither Fujitsu, nor IBM, nor any combination thereof, teaches or suggests "*wherein said irregularities comprise cavities formed periodically in said sapphire growth surface of said seed substrate during said molding a seed substrate*", as recited in claim 1, and similarly recited in claim 20.

Indeed, as detailed in section A, Applicant submits that IBM does not teach or suggest this feature. Furthermore, Applicant submits that Fujitsu fails to make up the deficiencies of IBM.

The Examiner alleges that Fujitsu teaches a method of growing sapphire on a silicon substrate at a temperature of 600°C and heat treating the grown sapphire at a temperature of 1270°C to form an alpha sapphire substrate. The Examiner attempts to rely on the Abstract of Fujitsu to support her allegations. Applicant, however, respectfully disagrees.

That is, nowhere in this passage does Fujitsu teach or suggest a method of producing a crystal growth substrate wherein the irregularities include cavities formed periodically in the sapphire growth surface of the seed substrate during the molding a seed substrate. Indeed, the Examiner does not even allege that Fujitsu teaches or suggests this feature.

Serial No. 10/628,492  
Docket No. T36-157944M/RS

13

Thus, Fujitsu fails to make up the deficiencies of IBM.

Therefore, Applicant submits that even if combined, the alleged combination of references would not teach or suggest each and every feature of the claimed invention. Therefore, the Examiner is respectfully requested to reconsider and withdraw this rejection.

### C. The Kawama Reference

The Examiner alleges that Kawama would have been combined with IBM to teach the claimed invention of claims 3 and 12. Applicant submits, however, that these references would not have been combined as alleged by the Examiner and that, even if combined, the combination of references would not teach or suggest each and every element of the claimed invention.

That is, the Examiner's motivation to modify IBM ("to remove silicon material from sapphire") does not appear to be a problem in IBM that would require a solution. That is, IBM already provides a means for removing the silicon material from the sapphire. IBM teaches that the silicon is removed from the sapphire styli array by evaporation or by contact with a 900°C Cu plate.

Thus, as pointed out in MPEP 2143.01, the Examiner's motivation is "improper". "The mere fact that references can be combined or modified does not render the resultant combination obvious **unless the prior art also suggests the desirability of the combination**" (emphasis added by Applicant). Therefore, Applicant submits that the Examiner has clearly not made a prima facie case of obviousness.

Moreover, neither Kawama, nor IBM, nor any combination thereof, teaches or suggests "*wherein said irregularities comprise cavities formed periodically in said sapphire growth surface of said seed substrate during said molding a seed substrate*", as recited in claim 1, and similarly recited in claim 20.

Indeed, as detailed in section A, Applicant submits that IBM does not teach or suggest this feature. Furthermore, Applicant submits that Kawama fails to make up the deficiencies of IBM.

The Examiner alleges that Kawama teaches etching silicon to separate the silicon from sapphire using HF. The Examiner attempts to rely on Figure 13b and column 23, lines 27-40 of Kawama to support her allegations.

However, nowhere in this passage or this figure (nor anywhere else for that matter)



Serial No. 10/628,492  
Docket No. T36-157944M/RS

14

does Kawama teach or suggest a method of producing a crystal growth substrate wherein the irregularities include cavities formed periodically in the sapphire growth surface of the seed substrate during the molding a seed substrate. Indeed, the Examiner does not even allege that Kawama teaches or suggests this feature.

Thus, Kawama fails to make up the deficiencies of IBM.

Therefore, Applicant submits that even if combined, the alleged combination of references would not teach or suggest each and every feature of the claimed invention. Therefore, the Examiner is respectfully requested to reconsider and withdraw this rejection.

#### **D. The Kamimura Reference**

The Examiner alleges that Kamimura would have been combined with IBM to teach the claimed invention of claims 7-9, 13 and 20. Applicant submits, however, that these references would not have been combined as alleged by the Examiner and that, even if combined, the combination of references would not teach or suggest each and every element of the claimed invention.

That is, the Examiner has not even provided a motivation to combine the applied prior art references. Applicant points out to the Examiner that MPEP § 2142 states “[t]o establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine the reference teachings” (emphasis in MPEP) and that “it is the duty of the examiner to explain why the combination of the teachings is proper”. The Examiner has not provided her reasoning for combining the references. Therefore, Applicant submits that Examiner has clearly not made a *prima facie* case of obviousness.

The Examiner has merely alleged that “[i]t would have been obvious to use sapphire produced by the process of IBM to grow GaN based layers and electrode to form light emitting device because [Kamimura] teaches growing GaN based layers “102-104” and electrode “140” on sapphire substrate “101” to form light emitting device” (see Office Action dated September 28, 2005 at pages 5-6). The Examiner has merely indicated what each applied reference teaches, but has not provided any motivation for combining the teachings.

The Examiner appears to be alleging that the mere presence of the disclosure of a feature in the Kamimura reference is sufficient to find that it would have been obvious to

Serial No. 10/628,492  
Docket No. T36-157944M/RS

15

modify the IBM reference based upon this disclosure.

However, the Examiner cannot merely gather a number of prior art references which each include some portion of the features recited in the claims and allege that the mere disclosure of the features in the combination of references is sufficient to allege obviousness of the claimed invention.

Rather, "[t]he mere fact that references can be combined or modified does not render the resultant combination unless the prior art also suggests the desirability of the combination." (Emphasis added, M.P.E.P. § 2143.01).

The Examiner fails to recognize that the mere disclosure of features in applied references is *prima facie* insufficient to maintain an obviousness rejection. Rather, the Examiner appears to ignore and, indeed, has failed to provide any teaching, suggestion or motivation for making the alleged modification.

Furthermore, it is pointed out that M.P.E.P. §2141.02 clearly states the following very basic evaluation guideline: "*In determining the differences between the prior art and the claims, the question under 35 U.S.C.103 is not whether the differences themselves would have been obvious, but whether the claimed invention as a whole would have been obvious*" (emphasis in MPEP itself).

This guideline reflects the well established concept in patentability evaluation that a new invention may "merely" be a new and different combination of known elements.

Along these lines, Judge Rader wrote in the recent Federal Circuit Court of Appeals holding in *Ruiz v. A.B. Chance Co.*, Federal Cir., No. 03-1333, January 29, 2004:

*"In making the assessment of differences, section 103 specifically requires consideration of the claimed invention "as a whole." Inventions typically are new combinations of existing principles or features. Envtl. Designs, Ltd. v. Union Oil Co., 713 F.2d 693, 698 (Fed. Cir. 1983) (noting that "virtually all [inventions] are combinations of old elements."). The "as a whole" instruction in title 35 prevents evaluation of the invention part by part. Without this important requirement, an obviousness assessment might break an invention into its component parts (A + B + C), then find a prior art reference containing A, another containing B, and another containing C, and on that basis alone declare the invention obvious. This form of hindsight reasoning, using the invention as a roadmap to find its prior art components, would discount the value of combining various existing features or principles in a new way to achieve a new result - often the very definition of invention."*

Although the holding in that case left undisturbed, under the "clear error" standard of

Serial No. 10/628,492  
Docket No. T36-157944M/RS

16

review, the conclusion of the District Court that the prior art references were properly combinable, it specifically explained that it declined to reverse this conclusion because "... the two references address precisely the same problem ... " (emphasis by Applicants)

This aspect of the *Ruiz* holding, in which precisely the same problem is being addressed by both references, is not present in the Kamimura and IBM references used in the prior art evaluation of the present Application.

Thus, as pointed out in MPEP 2143.01, the Examiner's motivation is "improper". Therefore, Applicant submits that the Examiner has clearly not made a *prima facie* case of obviousness.

Moreover, neither Kamimura, nor IBM, nor any combination thereof, teaches or suggests "*wherein cavities are formed periodically in said sapphire growth surface of said seed substrate during said molding a seed substrate*", as recited in claim 20.

Indeed, as detailed in section A, IBM does not teach or suggest this feature. Furthermore, the Examiner does not even allege that Kamimura teaches or suggests this feature. Thus, Kamimura fails to make up the deficiencies of IBM.

Therefore, Applicant submits that even if combined, the alleged combination of references would not teach or suggest each and every feature of the claimed invention. Therefore, the Examiner is respectfully requested to reconsider and withdraw this rejection.

## V. NEW CLAIMS

New claims 21-27 have been added to claim additional features of the invention and to provide more varied protection for the claimed invention. These claims are independently patentable because of the novel features recited therein.

Applicant submits that new claims 21-27 are patentable over any combination of the applied references at least for analogous reasons to those set forth above with respect to claims 1-9 and 12-20.

## VI. FORMAL MATTERS AND CONCLUSION

In view of the foregoing, Applicant submits that claims 1-9 and 12-27, all of the claims presently pending in the application, are patentably distinct over the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

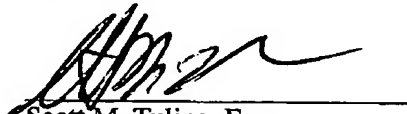
Serial No. 10/628,492  
Docket No. T36-157944M/RS

17

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic or personal interview.

The Commissioner is hereby authorized to charge any deficiency in fees or to credit any overpayment in fees to Attorney's Deposit Account No. 50-0481.

Respectfully Submitted,

Date: December 28, 2005  
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**FACSIMILE TRANSMISSION**

I hereby certify that I am filing this paper via facsimile, to Group Art Unit 2812, at (571) 273-8300, on December 28, 2005.

Respectfully Submitted,

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